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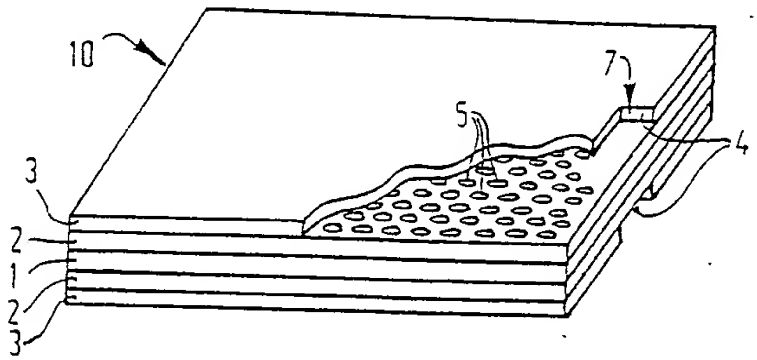

(57) Abstract

A device (10, 20, 30, 40) for measuring the presence of an electrical conducting liquid with at least one liquid absorbing layer (1), at least two moisture-pervious electrodes (2) approching the absorbing layer and means (7) for connecting the electrodes (2) to a measuring system (6), comprising at least one electrode (2) consisting either of a foil (38, 39) of flexible, eletrically conductive synthetic resin or a carrier (11, 12, 14, 15) provided with an electrically conductive coating (16).

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DEVICE FOR MEASURING THE PRESENCE OF ELECTRICAL CONDUCTING LIQUID RECEIVED THEREIN.

The invention relates to a device for measuring the presence of electrical conducting liquid comprising at least one liquid absorbing layer, at least two electrodes approaching the absorbing layer and being permeable to moisture and means for connecting the electrodes to a measuring system.

In a known device the two electrodes are connected to one another in the presence of the electrical conducting liquid so that an output voltage or current is generated in the measuring system which in response actuates an alarm.

An example of a device of the kind set forth in the preamble is a cotton diaper with two electrically conductive wires sewn in which can be connected through push-buttons to the measuring system. A disadvantage of these known diapers is that due to the high production costs they are practically not suitable for single use. Therefore, for repeated use the diapers have to be washed in order to flush away the hygroscopic salt residues, after which they have to be dried. The construction with these wire-shaped electrodes and the connection by means of push-buttons is poorly resistant to such a cleaning procedure so that after some time it is no longer certain whether the electric connection are still intact. An additional disadvantage of these known diapers is that prior to use this diaper cannot be tested for its effect.

In a further known device of the kind set forth in the preamble the electrodes are formed by metal foils, for example, tin foil or aluminium foil, in which apertures are provided for passing moisture. This known device has, however, the disadvantage that due to the use of metal foil the device as a whole can be deformed only with difficulty, which adversely affects the fitting form. Moreover, when the device is deformed cracks may occur in the foils so that the electric conductivity is interrupted.

The invention has for its object to provide a device of

the kind set forth in the preamble which mitigates the aforesaid inconveniences and which can be manufactured in a simple manner at lower costs so that the device is particularly suitable as a disposable product for single use. According to the invention this is achieved in that at least one elctrode is formed either by a foil of flexible electrically conductive synthetic resin or by a carrier provided with an electrically conductive coating.

When the connecting means comprise conductive members located each on an outer face of the device and made from the same material as the electrodes, a device is obtained with which the measuring system can readily establish a contact, whilst in addition the operation of the device can be simply tested from the outside.

When the absorbing layer and the carrier form part of one and the same strip of material a device is obtained in which the strip of material constitutes part of a path of material on which the electrodes are applied or pressed.

The invention furthermore relates to a strip of material intended for the manufacture of a device embodying the invention and being characterized in that at least one electrode applied thereto is either made from a foil of flexible, electrically conductive synthetic resin or comprises an electrically conductive coating.

Finally the invention relates to a method of manufacturing a device for measuring the presence of electrical conducting liquid, said method being characterized in accordance with the invention in that at least one moisture-pervious foil of electrically conductive synthetic resin is fastened or else at least one electrically conductive coating is applied to a strip of moisture-absorbing material and in that in dependence on the foil and/or the coating the strip is folded to form the device and finished.

The aforesaid and further features will be explained with reference to three embodiments represented by way of example with reference to the accompanying drawing.

Thew drawing shows is:

Fig. 1 schematically the structure of the device embodying the invention;

Fig. 2 a detailed, enlarged exploded view of a first embodiment of a device in accordance with the invention;

Fig. 3 a strip of material to form a second embodiment of the device in accordance with the invention;

Fig. 4 a device embodying the invention formed from the strip of material of fig. 3, connected to a measuring system; and

Fig. 5 a third embodiment of the device in accordance with the invention.

The device 10 shown in fig. 1 embodying the invention comprises a moisture-absorbing layer 1. On both sides of the layer 1 are provided electrically conductive layers 2, which are pervious to moisture through the apertures 5 provided therein. The electrodes 2 are each covered by a moisture-pervious protective layer 3 having holes 4 for connection to the measuring system 6.

Fig. 2 shows the structure of a device 20 embodying the invention, which structure is basically the same as the of the device 10 of fig. 1. The device 20 comprises five layers 11 to 15 each consisting of moisture-absorbing material, for example, the material of the layer 1.

The layers 11 and 15 are provided with conductive members 8 and 9 enclosed between connecting means 7 and formed by an electrically conductive coating 16 applied to the carrier 11, 15 in the form of an electrically conductive pain or ink. The layers 12 and 14 applied one on each side of the moisture-absorbing layer 13 are each provided with an electrode 2 of an electrically conductive coating 16 consisting of electrically conductive pain or ink in a pattern of a substantially fixed form. The parts 17 and 18 of the electrodes 2 are each connected with the coating 16 of the layers 11 and 15 respectively. The layer 13 sandwiched between the layers 12 and 14 provided with the electrodes 2 serves on the one hand to electrically separate the electrodes 2 from one another and on the other hand for the

electric through-connection of the two electrodes 2, when the layer 13 is moistened at a place located between the two electrodes with an electrical conducting liquid penetrating from the outer side 21, 22.

The coatings 16 of the layers 11 and 15 are arranged on the outer sides 21 and 22 respectively so that the function of the device 20 can be checked in a simple manner with the aid of moist fingers.

Fig. 3 shows a path of material 23 made from strips of material 24 to form a device 30 embodying the invention and shown in Fig. 4. Each strip of material 24 comprises zones 31 to 35 corresponding to the layers 11 to 15 of fig. 2, the difference being that the absorbing layer 33 and the carriers 31, 32, 34, 35 with the coating of electrically conductive paint or ink form part of one and the same strip of material 24.

The path of material 24 is cut along the lines 25 and via the folding lines 26 the strip of material 24 is folded to form the device 30 shown in fig. 4, the device being finished by means of stitching or a glue joint 27.

The device 30 is connected by means of a pinching contact 28 through an electric cable 29 to the measuring unit 36 of the measuring system 6 by which, when an electrically conductive contact is established between the electrodes 2, and audible signal is produced through the alarm 37.

Fig. 5 shows a device 40 embodying the invention, the structure of which is mainly identical to that of the device 10 of Fig. 1. In this case, however, the electrodes 2 approaching the absorbing layer 1, are located only on one side thereof. In this case the electrodes 2 are each formed by a foil 38, 39 of a flexible, electrically conductive synthetic resin, for example, a carbon-doped polymer. The conductive members 8, 9 are also made from this synthetic resin and are associated with the foils 38 and 39 respectively. The foils 38 and 39 have complementary shapes in which tongues 41 and 42 respectively of the foils 38 and 39 respectively are in direct proximity one of the other over a very large distance. The measuring system 6 will produce an

audible alarm when an electric contact is established between the tongues 41 and 42. In the device shown in fig. 5 only one protective layer 3 need to be used. The absorbing layer 1, the two foils 38, 39 and the protective layer 3 are finished to form the device 40 by sealing the various layers and foils to one another so that the device 40 exhibits welding seams 43. The device 40 is furthermore provided in accordance with the invention with adhering means 44, by which the device 40 can be fixed, for example, to underwear.

It will be obvious that by using a larger number of electrodes, each of which is separately connected to the measuring system 6, the presence of conductive fluid can be assessed in dependence on locations.

Although not limited thereto the devices 10, 20, 30, 40 embodying the invention are particularly suitable for treating the disease enuresis-nocturna. A further use is, for example, the detection of wound fluid, in dependence on which a bandage has or does not have to be replaced.

It will be obvious that, for example, by forming the device 30 from the path of material 23 this device can be manufactured to any desired size. Moreover, as shown in Fig. 3, the absorbing layer, in this case the zone 33, may consist of a small multiple of such zones 33', so that in accordance with the use of the device 30 embodying the invention the number of absorbing layers can be raised.

C L A I M S

1. A device (10, 20, 30, 40) for measuring the presence of an electrical conducting liquid comprising at least one liquid absorbing layer (1), at least two moisture-pervious electrodes (2) approaching the absorbing layer and means (7) for connecting the electrodes (2) to a measuring system (6), characterized in that at least one electrode (2) is formed either by a foil (38, 39) of flexible, electrically conductive synthetic resin or by a carrier (11, 12, 14, 15) provided with an electrically conductive coating (16).

2. A device (40) as claimed in claim 1, characterized in that the electrically conductive synthetic resin contains a polymer doped, for example, with carbon.

3. A device (20, 30) as claimed in claim 1, characterized in that the electrically conductive coating (16) consists of an electrically conductive paint or ink (16).

4. A device (20) as claimed in anyone of the preceding claims, characterized in that the connecting means (6) comprise conductive members (8, 9) each of which is located on an outer face (21, 22) of the device (20) and made from the same material (16) as the electrodes (2).

5. A device (30) as claimed in anyone of the preceding claims, characterized in that the absorbing layer (1) and the carriers (31, 35) form part of one and the same strip of material (24).

6. A strip of material (24) intended for the manufacture of a device (30, 40) as claimed in claim 5, characterized by at least one electrode (2) applied thereto consisting either of a foil (38, 39) of flexible, electrically conductive synthetic resin or an electrically conductive coating (16).

7. A path of material (23) comprising at least two strips of material (24) as claimed in claim 6.

8. A method of manufacturing a device (30, 40) for measuring the presence of electrical conducting liquid,

characterized in that either at least one moisture-pervious foil (38, 39) of electrically conductive synthetic resin is fastened to or at least one electrically conductive coating (16) is applied to a strip (24) of moisture-absorbing material (1) and in dependence on the foil (38, 39) and/or the coating (16) the strip (24) is folded to form the device (30, 40) which is then finished.

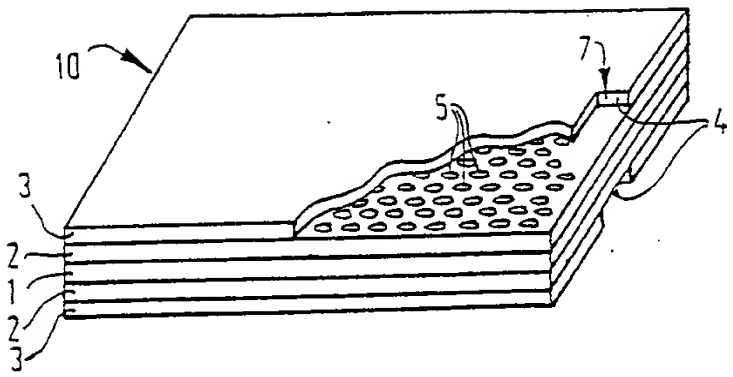


FIG.1

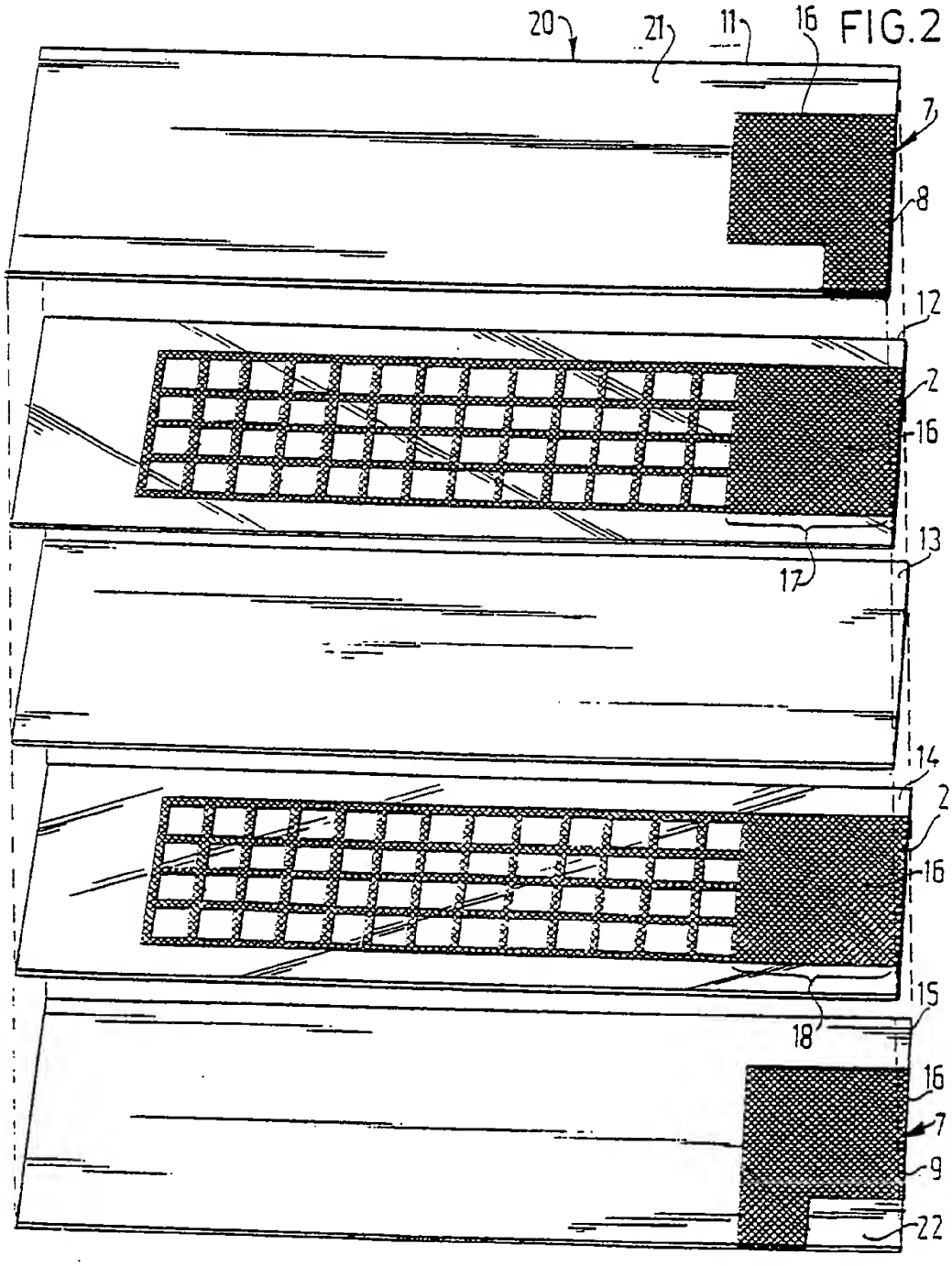


FIG.2

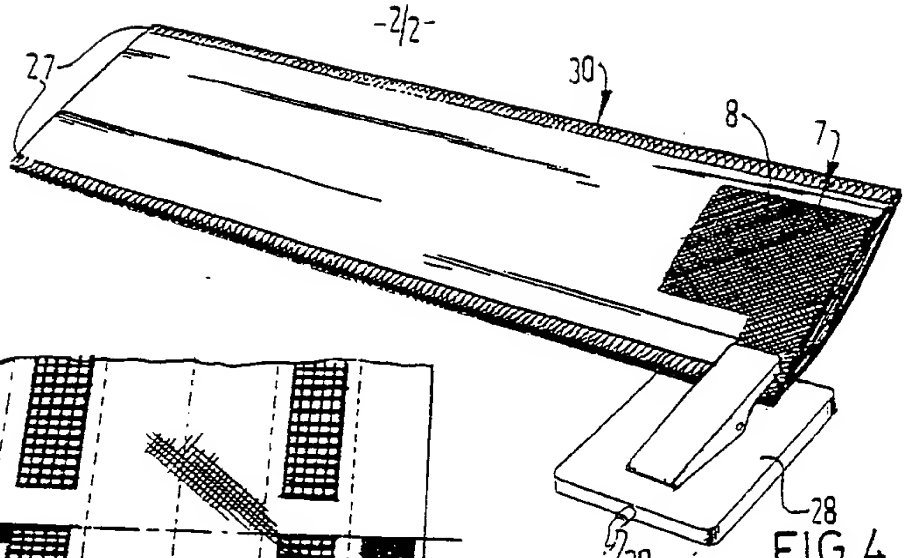
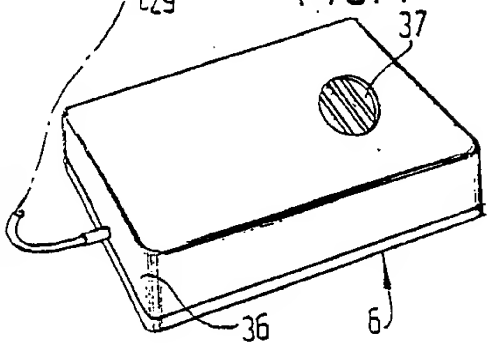


FIG. 4



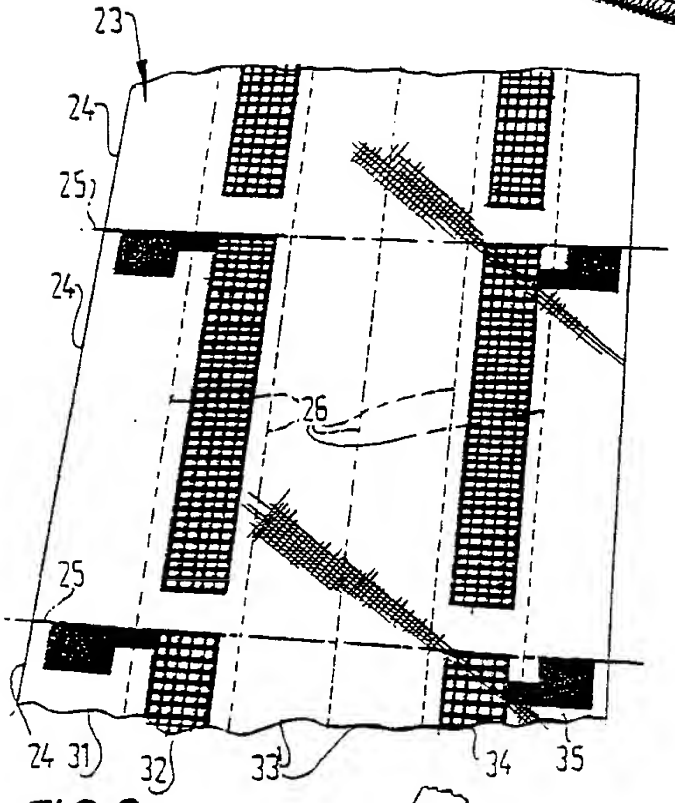
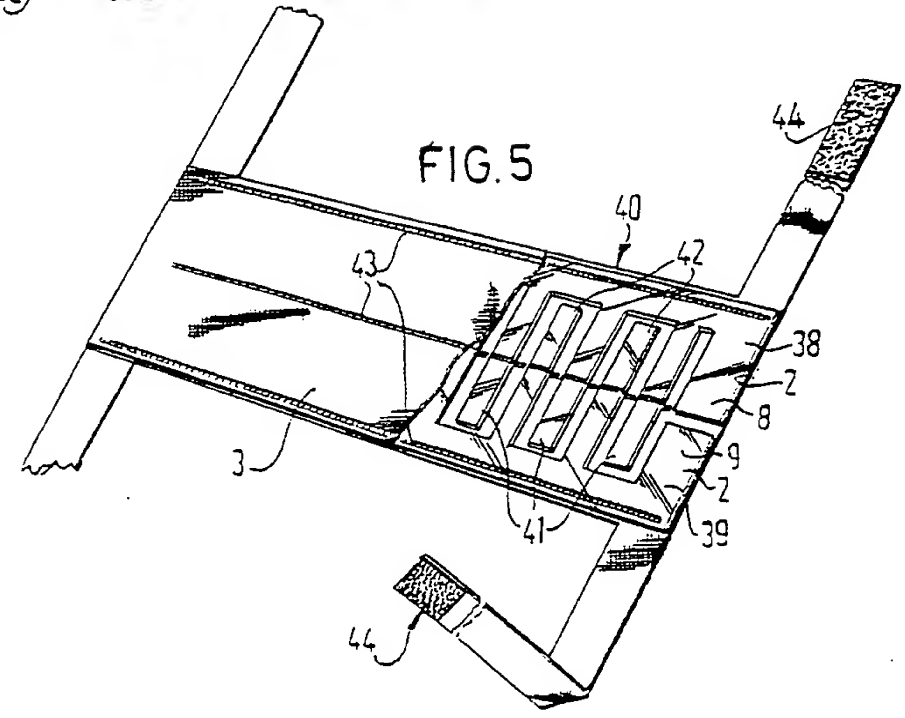


FIG. 3

FIG. 5



INTERNATIONAL SEARCH REPORT

International Application No PCT/NL 83/00037

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[3]: G 01 N 27/12; A 61 F 5/48

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC[3]	G 01 N 27/12; G 01 N 27/22; A 61 F 5/48

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
Y	US, A, 4191950 (P.D. LEVIN) 4 March 1980, see column 1, line 57 - column 3, line 30	1,4,6,8
Y	GB, A, 772452 (J.C. DAVENPORT) 27 May 1955, see page 1, lines 24-76	1,6,8
A	FR, A, 2469202 (J. TACUSSEL) 22 May 1981, see page 13, lines 15-19	1,2
A	GB, A, 1521489 (P.H. HOOKER) 18 August 1978, see claim 1	1,3
A	FR, A, 2196588 (D. PARCELLIER) 15 March 1974, see pages 7,8	1
A	US, A, 2668202 (B.D. KAPLAN) 2 August 1952, see figure 1	1
A	BE, A, 352885 (A.B. LAMBERT) 11 April 1928, see claim 1	1

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IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
5th January 1984	24 JAN. 1984
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EUROPEAN PATENT OFFICE	G.L.M. Kruydenberg

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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

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US-A- 4191950	04/03/80	None	
GB-A- 772452		None	
FR-A- 2469202	22/05/81	None	
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FR-A- 2196588	15/03/74	None	
US-A- 2668202		None	
BE-A- 352885		None	